SOME INTERACTIONS OF MODAL AUXILIARIES AND NEGATION IN JAPANESE: A CASE FOR THE THEORY OF BINDING AT LF*

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0. INTRODUCTION

This article aims to deal with one of the hitherto least explored areas in the Government and Binding (GB) literature, and attempts to discuss a range of phenomena involving modal auxiliaries (hereafter modals) and their interactions with negation in Japanese. In particular, we will examine a number of syntactic asymmetries of much interest observed in sentences that involve modals and negation.[1] More specifically, let us consider the following paired examples that exhibit such asymmetries:[2]

(1) a. John-wa kyoo-no kaigi-ni syussekis-i
-top today-gen meeting-to attend
na-i *daroo*
Neg would
'(lit.) John would not attend today's meeting'

b. *John-wa kyoo-no kaigi-ni syussekisur-u
daroo-(de) *na-i*
would Neg
'(lit.) John wouldn't attend today's meeting'
(It is not the case that John would attend today's meeting)

(2) a. Mary-wa gakkoo-o yasum-a *na-i* *hazu-da*
-top school-acc be absent Neg should
'(lit.) Mary should not be absent from school'
(Mary is not expected to be absent from school)

b. Mary-wa gakkoo-o yasum-u *hazu-ga* *na-i*
should Neg
'(lit.) Mary shouldn't be absent from school'
(It is improbable that Mary will be absent from school)

Clearly, examples in (1) reveal an asymmetry with respect to whether modals like *daroo* 'would' can fall under the scope of negation: that is, (la), which involves the so-called "internal negation" (=propositional negation), is ruled in, whereas (1b), which involves the so-called "external negation" (= modal negation), is ruled out. (See section 2.1 for relevant discussion as to how the internal/external distinction is explained in our system.) Thus, the internal/external (negation) asymmetry obtains with respect to *daroo*-type modals; namely, (what we shall now call) epistemic-type modals.

Another asymmetry is found when we compare (1) with (2). Notice, in this connection, that the former involves epistemic-type modals like *daroo*, as just seen above, but the

latter involves modals like *hazu-da* 'should'; namely, (what we shall now call) root-type modals. Strikingly, (2) contrasts sharply with (1), in that external (as well as internal) negation is allowed in (2), which is not the case with (1). This observation indicates that unlike the case of epistemic-type modals like *daroo* in (1), there is no internal/external negation asymmetry with regard to root-type modals in (2). Hence, the asymmetry here is between root- and epistemic-type modals that interact with (either internal or external) negation.

How should we account for the asymmetries observed above? As a matter of fact, however, no syntactic explanation has been proposed for them in a principled fashion. Therefore, how to provide a principled account for these asymmetries, I hold, will be the central aim of this article in dealing with some interactions of modals and negation in Japanese.

The organization of this article is as follows: the first two sections that immediately follow will be devoted to a semantic and syntactic characterization of modals (section 1.1) and a critical examination of the previous analyses (section 1.2). In sections 2.1 and 2.2, we will propose an alternative analysis that incorporates the Theory of Binding as a licensing principle at LF, assuming the general framework of Chomsky (1981, 1982; in particular 1986a, 1986b) crucially combined with Aoun (1985). Then section 2.3 will discuss some consequences of the proposed analysis. In the course of discussion, our analysis will be shown to elucidate the nature of modals and negation as well. The final section will contain some

concluding remarks.

1. PROPERTIES AND PREVIOUS ANALYSES

1.1. On the Characterization of Modals

Throughout the following argument, we will assume that it is essential to distinguish root-type modals from epistemic-type modals in Japanese. In this section, it will be argued that a cluster of semantic and syntactic properties not only serve to define these two types of modals, but also render compelling support to this assumption, which will entail some interesting consequences, as we shall see in section 2.3.

Semantically, as is well known, root-type modals are characterized as those of dynamic or deontic (obligation- and necessity-based) meaning, while epistemic-type modals as those of epistemic (possibility- and knowledge-based) meaning. (See Palmer (1979) for some relevant discussion in English.) That is, root-type modals include *hazu-da* 'should', *wake-da* 'ought to', *koto-da* 'be requested', etc., denoting necessity or obligation, but those of epistemic-type include *daroo* 'would', *rasii* 'may', *sooda* 'I hear'[3], etc., denoting possibility or logical entailment.[4]

Furthermore, root-type and epistemic-type modals differ syntactically from each other in some important respects. One notable difference occurs in the surface order, more precisely, the relative scope order between them. Observe the following sentence, which is typically represented in Japanese:

(3) [John-wa Kyozin-gun-ni nyuudansu-ru]
-top the Giants-in join (verb stem)
hazu-ga – na-i – daroo – ne
Root M. Neg Epis. M. Illocution
'(lit.) John would not should (=be expected to) join the Giants, would he?'

Kageyama (1976) observes that illocutionary auxiliaries, such as *ne* 'tag question', may take the widest scope over the entire clause, while epistemic-type modals the second widest clausal scope, thereby taking in their scope Neg and root-type modals, but not illocutionary auxiliaries. This suggests that these verbal elements in (3) cannot be reordered without incurring ungrammaticality, as shown in (4):

(4) [John-wa Kyozin-gun-ni nyuudan-si/-suru]
-top the Giants-in join (verb stem)
a. **na-i – daroo – hazu-da – ne*
Neg Epis. M. Root M. Ill.
b. **hazu(-da) – daroo – na-i – ne*
Root M. Epis. M. Neg Ill.
c. **hazu-ga – na-i – ne – daroo*
Root M. Neg Ill. Epis. M.

We see then that epistemic-type modals must follow root-type modals (as well as Neg) as to their scope order, as in (4), and that root-type modals, as against epistemic-type modals, are not entirely like pure modals (i.e., they are more like main verbs), since they can simply contribute to supplementing the semantic content of main verbs, as just seen

above.[5] Thus, it seems fairly reasonable to assume that epistemic-type modals can take clausal scope which root-type modals lack.

Another syntactic property that helps to differentiate between modals concerns the finite/nonfinite distinction. For instance, this point will become clearer when we examine the occurrence of nonfinite forms such as [±Past]:

(5) [Salieri-wa Mozart-o dokusatusi-ta]
-top -acc have poisoned
a. ＊*daroo-dat*-ta (probability or possibility)
would-past
'(lit.) Salieri did would have poisoned Mozart'
b.?＊*rasi-kat*-ta (possibility or likelihood)
may-past
'(lit.) Salieri did may have poisoned Mozart'

(6) [Salieri-wa Mozart-o dokusatusi-ta]
-top -acc have poisoned
a. *hazu-dat*-ta (necessity)
should-past
'(lit.) Salieri did should have poisoned Mozart'
(There was strong reason to believe that Salieri did poison Mozart)
b. *wake-dat*-ta (logical necessity)
ought to-past
'(lit.) Salieri did ought to have poisoned Mozart'
(It was natural that Salieri did poison Mozart)

It is immediately clear that unlike root-type modals in

(6a, b), neither of the epistemic-type modals in (5a, b) has nonfinite (i.e., Past Tense) forms: that is, they are inherently finite (i.e., tensed), referring to Present Tense (cf. Nakau 1979). Note in this respect, too, that this fact renders additional support to the aforementioned assumption that root-type modals are more like main verbs, lacking clausal scope. Hence, this contrast can be accounted for most naturally if we assume that the property of being finite, namely Tense, cannot be iterated.

To summarize the preceding discussion, any syntactic analysis must offer a unified account for the following two properties that differentiate between Japanese modals: (i) epistemic-type modals are unique in having clausal scope that root-type modals lack; (ii) root-type modals are (in some degree) intermediate between epistemic-type modals and main verbs.[6]

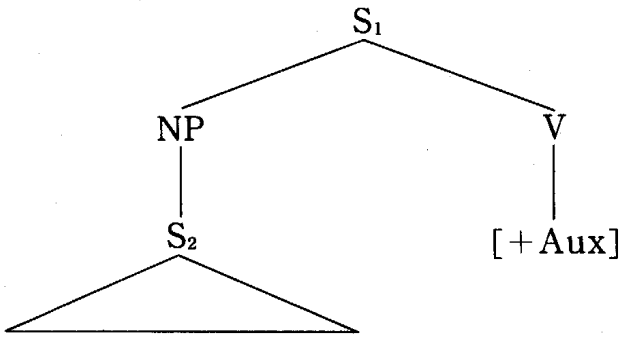
1.2. A Critique of the Standard Analyses

Having so far achieved the semantic and syntactic characterization of these two types of modals, we will move on to present a critique of the standard (traditionally held) analyses of modals and negation (cf. Inoue 1976, McGloin 1972, 1976, Sawada 1980, and others).

The standard syntactic analyses are in common based on the complex structure analysis, in which modals, whether root-type or epistemic-type, are underlyingly treated as intransitive verbs that take a sentential (subject) argument. Likewise, in accordance with McGloin's (1976) analysis, Neg is also treated in the same manner as modals. Then, this

analysis will have to posit the underlying structure where modals are placed under the V node, as roughly schematized in (7):

(7)



Within the standard analysis, the S(urface)-structure is derived from the complex underlying structure (7) (by a series of such transformations as Subject Raising, Predicate Raising, etc.), and thereby becomes simplex with the V position still occupied by modals (and Neg as well). What is to be noted here, however, is that there is no postulation of a syntactic representation like (the level of) Logical Form, at which scope (ambiguity) is generally determined (see section 2.1). Since the derivational process has no direct relevance to the present discussion, we will not dwell upon it here any further.

With this much as background, we will now argue that there are a number of possible problems to show that the standard analyses under discussion are untenable.

One serious problem with the standard syntactic analyses comes from a failure to capture the scope-bearing property that differentiates between modals in Japanese. More specifically, it is far from clear how they can account for the fact

that epistemic-type modals show the unique property of taking clausal scope that root-type modals lack, as characterized in section 1.1. That is, it seems highly questionable whether modals, as intransitive (main) verbs marked as [+Aux], have the potential to assign scope over the clause, so far as they appear in the V position without postulating any syntactic representation in which scope is defined.

A second serious problem with the traditionally held analyses is that they are at variance with Roberts's analysis of modals. Roberts (1983, 1985) argues that modals, in contrast to main verbs, can have no arguments at all and so assign no main θ-roles, thereby appearing in ungoverned positions, as required by the Condition on θ-role assignment below:

(8) *The V-Visibility Condition* (Roberts 1985: 29)
V assigns θ-roles iff V is governed.

Since (8) prevents modals from appearing in governed positions, we may predict that modals must appear in INFL, but main verbs cannot, because the INFL position, but not the V position, is an ungoverned position bearing no θ-roles. Thus, if Roberts is indeed on the right track, this prediction clearly stands in conflict with the structure (7), in which modals, as main verbs marked as [+Aux], appear in the V position. Accordingly, this in turn argues against the traditionally held analyses. Furthermore, this prediction will be borne out in the course of the discussion to follow.

Last but certainly not least is how to account for such problematic asymmetries as observed in (1) and (2), especially

including those in the following examples, reproduced here as (9a, b):

(9) a. Mary-wa gakkoo-o yasum-u *hazu-ga na-i*
-top school-acc be absent should Neg
'(lit.) Mary shouldn't be absent from school'
(It is improbable that Mary will be absent from school)

b. *Mary-wa gakkoo-o yasum-u *daroo-de na-i*
-top school-acc be absent would Neg
'(lit.) Mary wouldn't be absent from school'
(It is not the case that Mary would be absent from school)

The root/epistemic asymmetry with respect to negation, as shown above, clearly indicates that root-type modals are allowed to be negated, as in (9a), but epistemic-type modals are not, as in (9b). This asymmetry, however, has been, and still is left unexplained by the standard analyses at issue, since modals, regardless of root or epistemic, are taken to be intransitive (main) verbs marked as [+Aux]. In addition, the postulation of taking modals to be main verbs without any independent motivation seems hardly plausible.

2. AN ALTERNATIVE ANALYSIS

In what follows, we will now argue that these inadequacies encountered by the standard syntactic analyses do not arise in the alternative analysis to be proposed below.

2.1. Modals, Negation and LF Operator Movement

Before embarking on an alternative analysis, however, we would like to maintain the following assumption which is central to the subsequent discussion:

(10) Modals and Neg(ative) are both interpreted as scopal operators with either clausal or nonclausal scope.

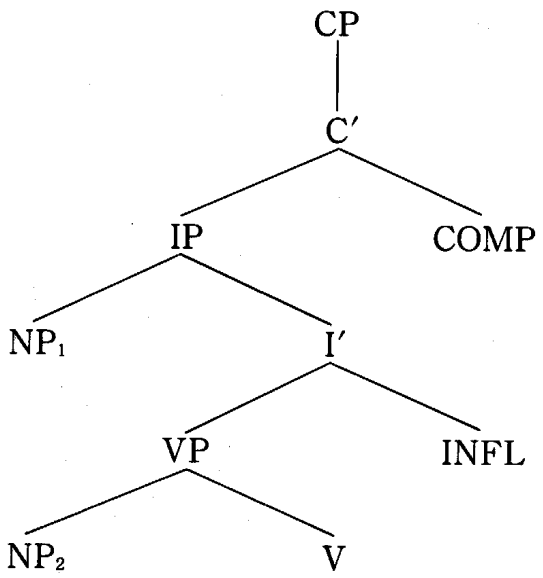
One consequence of this is that they are base-generated in INFL: in other words, the INFL position is where (scopal) operators, regardless of clausal or nonclausal, must appear at D-structure (see Chomsky 1982, 1986, Roberts 1983, 1985, etc. for relevant discussion).[7] Another vital consequence is that such operators must appear in the appropriate position in which their scope is determined at a relevant level (i.e., Logical Form (=LF)).[8] To illustrate the correlation between the two consequences, let us assume that scope (ambiguity) is generally expressed by means of c-command at LF, as in May (1977, 1985) and Huang (1982). We also assume, following Chomsky (1986a), that the notion of c-command is defined in terms of the first branching node, instead of the first maximal projection, since such a definition of c-command is relevant only to the Binding Theory, not to the Theory of Government, which will play an essential role in our analysis. Thus, the definition of c-command employed here is as in (11):

(11) α c-commands β iff α does not dominate β and every γ that dominates α dominates β. (γ=any branching

category) (Chomsky 1986a: 8)

In light of (11), let us first of all observe the following basic structure that we assume for Japanese:[9]

(12)



We follow Chomsky (1986a) and others in assuming that INFL is the head of IP (=S) and that the head of CP (=S′) is COMP. According to (11), COMP c-commands IP, thus having scope over the entire clause IP (i.e., clausal scope). INFL, on the other hand, c-commands only VP, but does not c-command NP_1 (=the subject), nor IP either, thus having only VP-internal scope. The crucial point here is that the INFL position is where scopal operators, either clausal or nonclausal, appear at D-structure (and S-structure as well), whereas the COMP position is where only clausal operators must appear at LF in order for them to take scope over the clause.[10] Note that we assume here, without explicit justification, that *wh*-operators in Japanese (just as in English), how-

ever, must adjoin to CP and must appear in the specifier position of CP at LF (which, we assume, is the widest scope-bearing position in a clause).

Let us now see how our system can handle the scope-bearing property of modals, root or epistemic, and Neg in question. Suppose first that epistemic-type modals, being interpreted as clausal operators in our system, are thus base-generated in INFL, and must subsequently move into COMP from INFL (in order for them to take clausal scope) by Operator Movement (=Move α) at LF, leaving behind a coindexed trace.[11] Then, under this assumption, sentence (13a), for instance, is represented as in (13b) at LF below:

(13) a. Kono tai-wa asita-no
this sea bream-top tomorrow-gen
asa-made mot-u *daroo*
tomorrow-until keep would
'This sea bream would keep until tomorrow morning'

b. $[_{CP}\ [_{C'}\ [_{IP}$ Kono tai-wa asita-no asa-made mot-u $[_{INFL}\ t_i]]]\ [_{COMP}\ daroo_i]]]$

We observe then that such clausal operators as *daroo* in INFL can raise to the COMP position, since there is no barrier (IP) between $daroo_i$ and t_i in (13b).[12] This particular relation between INFL and COMP can be captured by virtue of the Head Movement Constraint (14), as it is defined in Chomsky (1986: 71):

(14) Movement of a zero-level category β is restricted to

the position of a head α that governs the maximal projection γ of β, where α θ-governs or L-marks γ if $\alpha \neq$ C.

It shoud be noticed, in this regard, that only clausal operators are subject to obligatory Movement to COMP at LF: unlike epistemic-type modals, root-type modals are prevented from appearing in COMP. This point can be illustrated by comparing (13) with (15):

(15) a. Kono tai-wa asita-no
this sea bream-top tomorrow-gen
asa-made motu- *hazu-da*
tomorrow-until keep should
'This sea bream should keep until tomorrow morning'

b. [$_{CP}$ [$_{C'}$ [$_{IP}$ Kono tai-wa asita-no asa-made mot-u [$_{INFL}$ *hazu-da*]]]]

We assume that (15b) is the well-formed LF structure of (15a). The structural difference between (13b) and (15b) resides in the fact that *daroo* in (13a), which has undergone LF Operator Movement, is moved from INFL to COMP, as in (13b), but *hazu-da* in (15a), which belongs to root-type modals, is in fact unmoved even at LF, as in (15b). That is, since root-type modals like *hazu-da* lack clausal scope, as noted earlier, and since COMP is a potential position c-commanding and thus having clausal scope, it follows that they are not subject to LF Operator Movement: hence, they can never be allowed to appear in COMP at LF.

Let us next consider the status of Neg in (16), which is ambiguous as to the scope of negation:

(16) a. Kono tai-wa asita-no
this sea bream-top tomorrow-gen
asa-made mot-a *na-i* (ne)
tomorrow-until keep Neg
'This sea bream does not keep until tomorrow morning'

b. $[_{CP}\ [_{C'}\ [_{IP}$ Kono tai-wa asita-no asa-made mot-a $[_{INFL}\ t_i]]\ [_{COMP}\ na\text{-}i_i$ (Neg^1)]]
'It is not the case that this sea bream will keep until tomorrow morning'

c. $[_{CP}\ [_{C'}\ [_{IP}$ Kono tai-wa asita-no asa-made mot-a $[_{INFL}\ na\text{-}i$ (Neg^2)]]]]
'This sea bream will not keep until tomorrow morning'

Here we will assume that Neg can act as an operator that takes either clausal or nonclausal scope. If Neg takes clausal scope, which we shall now call "external negation", Operator Movement at LF requires $na\text{-}i_i$ (Neg^1) to be present in COMP at LF, as in (16b), taking scope over the clause IP. On the other hand, if Neg takes nonclausal (i.e., VP-internal) scope, which we shall now call "internal negation", *na-i* (Neg^2) does not have to move into COMP from INFL in the mapping from D- and S-structures to LF, as in (16c), because the COMP position is where clausal operators must appear at LF. This explains why (16a) exhibits an ambiguous scope of negation between (16b) and (16c); hence, the ambiguity be-

tween external and internal negation, as it is generally held.

In conclusion, these considerations lead us to propose a general condition on scope interpretation with respect to such operators as modals and Neg as follows:

(17) Every operator is allowed to appear in COMP at LF only if it takes scope over the clause.

2.2 The Theory of Binding at LF

In the preceding discussion, we have claimed that modals, whether root or epistemic, and Neg, whether clausal (Neg^1) or nonclausal (Neg^2), are both treated as scopal operators, but both epistemic-type modals and Neg^1 differ from both root-type modals and Neg^2, in that the former, being interpreted as clausal operators, do involve obligatory LF Operator Movement to COMP, whereas the latter, as nonclausal operators, disallow such movement to COMP. With this mechanism in mind, we will proceed to advance an alternative analysis, which crucially involves the following assumptions:

(18) a. LF Operator Movement is constrained by the Binding Theory at LF.
b. Every (clausal) operator must be licensed at LF by A′-binding a variable.

The assumption (18a) follows from the requirement that the relation between an operator and a variable (it binds) must satisfy the Binding Theory at LF, which, we hold, is a general principle of UG. In particular, following Aoun (1985),

we will assume that the Binding Theory to be adopted here is generalized from A-Binding to X-Binding (where X=A or A′) as follows:

(19) a. α is X-bound by β iff α and β are coindexed, β c-commands α, and β is in an X-position.
b. α is X-free iff it is not X-bound.
c. α is locally bound by β iff α is X-bound by β, and if γ Y-binds α, then either γ Y-binds β or $\gamma=\beta$.
d. α is locally X-bound by β iff α is locally bound and X-bound by β.
(where X/Y=A or A′) (Aoun 1985: 27)

According to the above definition of X-Binding, Aoun (1985) proposes a reformulation of the Binding Principles (proposed and developed by Chomsky 1981, 1982) as follows:

(20) *Generalized Binding Principles* (Aoun 1985: 28)
A. An anaphor must be X-bound in its governing category.
B. A pronominal must be X-free in its governing category.
C. A name must be A-free.
(where X=A or A′)

(21) β is a *governing category* for α iff β is the minimal maximal projection containing α, a governor of α, and a SUBJECT accessible to α. (Aoun 1985: 33)

The assumption (18b) is the licensing principle, coupled

with (18a), that requires every operator to appear in COMP, namely in an A′-position at LF, in order for it to assign scope over the clause (cf. the Condition (17)), and, in addition, to bind its trace (=variable) left by LF Movement (see Chomsky 1986 and Pesetsky 1987 for relevant discussion on this matter). This necessarily entails that the variable (i.e., a trace left in INFL) must be treated as an A′-anaphor that needs to have a c-commanding antecedent in an A′-position (hence, A′-operator) in the sense of Aoun (1985).

Thus, given the assumptions (18a, b), we are now led to suggest that the relation holding between an A′-operator (in COMP) and a variable (in INFL) is subject to Principle (A) of the Generalized Binding Theory in (20), which requires that a variable, now as an A′-anaphor, be A′-bound by an operator in its governing category.

2.3. Some Consequences

We are now in a position to discuss some consequences of the proposed analysis, providing a principled explanation for some interactions of modals and negation in Japanese, especially, such asymmetries as observed in the introductory section.

2.3.1. Some Interactions of Epistemic-Type Modals and Negation

Let us first examine how the proposed analysis can handle the first asymmetry (i.e., the internal/external negation asymmetry with respect to epistemic-type modals) observed in (1). The structures underlying (1a, b) will look like the

following:

(22) a. $[_{CP}\ [_{C'}\ [_{IP}$ John-wa kyoo-no kaigi-ni
-top today-gen meeting-to
syussekis-i $[_{INFL}$ *na-i* *daroo*]]]]
attend Neg[2] would
'(lit.) John would not attend today's meeting'

b. *$[_{CP}\ [_{C'}\ [_{IP}$ John-wa kyoo-no kaigi-ni
syussekisur-u $[_{INFL}$ *daroo* *na-i*]]]]
would Neg[1]
'(lit.) John wouldn't attend today's meeting'
(It is not the case that John would attend today's meeting)

To derive from (22a, b) their corresponding structures at LF, we need to appeal to the operation of LF Operator Movement, as required by the Condition (17). It should be recalled here that LF Operator Movement can move an operator to COMP (from INFL) only if it takes clausal scope. That is, epistemic-type modals like *daroo* in (22a, b) and *na-i* 'Neg[1]' in (22b) (which has the effect of externally negating the entire clause; i.e., external negation), which are both interpreted as clausal operators, as already argued above, do in fact undergo LF Operator Movement obligatorily, thereby appearing in COMP at LF and leaving behind a coindexed trace. Unlike *na-i* 'Neg[1]' in (22b), however, *na-i* 'Neg[2]' in (22a), which has the effect of internally negating within the clause (i.e., internal negation) and is thus interpreted as a nonclausal operator, does not undergo such movement to COMP, thereby remaining *in situ* in INFL even at LF. Hence, under this analysis,

examples (22a, b) are assigned the legitimate LF structures such as the following:

(23) a. $[_{CP}\ [_{IP}$ John-wa kyoo-no kaigi-ni syussekis-i $[_{INFL}$ *na-i* $t_i]]\ [_{COMP}$ *daroo*$_i]]$

b. $*[_{CP}\ [_{IP}$ John-wa kyoo-no kaigi-ni syussekisur-u $[_{INFL}$ t_i $t_j]]\ [_{COMP}$ *daroo*$_i$ *na-i*$_j]]$

By virtue of Binding Principle (A), each trace in INFL, being an A′-anaphor, must be A′-bound in its governing category. In (23a), the only trace, t_i, is A′-bound by its own c-commanding antecedent, *daroo*$_i$, in its governing category CP; hence, (23a) satisfies Binding Principle (A) and is ruled grammatical. Only in (23b), by contrast, is neither t_i nor t_j c-commanded (because of the appearance of two distinct clausal operators in COMP) and thus A′-bound by *daroo*$_i$ and *na-i*$_j$, respectively, in its governing category CP, violating Principle (A) and rendering (23b) ungrammatical as required.[13] Thus, we see that this line of argument can successfully predict the difference in grammaticality between (1a) and (1b).

Furthermore, analogous phenomena will be observed with other epistemic-type modals that interact with either internal or external negation as well, as illustrated by the following examples:

(24) Tyoosyoku-ni gohan-o taber-u Nihonzin-wa ooku
breakfast-to rice-acc eat-pres Japanese-top many

a. *na-i* *rasii* (possibility or likelihood)
Neg[2] be likely

'It is likely that the number of Japanese who eat rice for breakfast is not large'

b. *na-i sooda* (logical entailment)
Neg[2] I hear
'I hear that the number of Japanese who eat rice for breakfast is not large'

c. *na-i yooda* (probability or possibility)
Neg[2] seem
'It seems that the number of Japanese who eat rice for breakfast is not large'

(25) Tyoosyoku-ni gohan-o taber-u Nihonzin-wa ooi
breakfast-to rice-acc eat-pres Japanese-top many

a. **rasiku-(wa) na-i*
be likely Neg[1]
'It is not likely that the number of Japanese who eat rice for breakfast is large'

b. **soode-(wa) na-i*
I hear Neg[1]
'*I do not hear that the number of Japanese who eat rice for breakfast is large'

c. **yoode-(wa) na-i*
seem Neg[1]
'It does not seem that the number of Japanese who eat rice for breakfast is large'

As in the case of *daroo* in (23), it is crucial to assume that epistemic-type modals in both (24) and (25), such as *rasii* 'may', *sooda* 'I hear', and *yooda* 'seem', must undergo Operator Movement at LF, and so must *na-i* 'Neg[1]' (=extenal nega-

tion) in (25), as against *na-i* 'Neg^2' (=internal negation) in (24), whereby they are repositioned in COMP. Then, after applying LF Operator Movement to (24) and (25), we will obtain the following derived structures (irrelevant details omitted):

(26) $[_{CP}\ [_{IP}$ Tyoosyoku-ni gohan-o taber-u Nihonzin-wa ooku
  a. $[_{INFL}$ *na-i* $t_i]]$ $[_{COMP}$ *rasii*$_i]]$
  b. $[_{INFL}$ *na-i* $t_i]]$ $[_{COMP}$ *sooda*$_i]]$
  c. $[_{INFL}$ *na-i* $t_i]]$ $[_{COMP}$ *yooda*$_i]]$

(27) $[_{CP}\ [_{IP}$ Tyoosyoku-ni gohan-o taber-u Nihonzin-wa ooi
  a. $*[_{INFL}$ t_i $t_j]]$ $[_{COMP}$ *rasiku*$_i$-(*wa*) *na-i*$_j]]$
  b. $*[_{INFL}$ t_i $t_j]]$ $[_{COMP}$ *soode*$_i$-(*wa*) *na-i*$_j]]$
  c. $*[_{INFL}$ t_i $t_j]]$ $[_{COMP}$ *yoode*$_i$-(*wa*) *na-i*$_j]]$

As we have just mentioned above, all the LF structures in (26) are ruled in for the same reason as is (23a), and those in (27) are ruled out for the same reason as is (23b). In other words, examples (26a, b, c) are permitted and examples (27a, b, c) are barred by Binding Principle (A), a licensing principle at LF, to the effect that each clausal operator in COMP must A′-bind its own variable at LF.

Thus, it is now found that the present analysis, crucially based on the Binding Theory at LF, are capable of explaining the internal/external negation asymmetry between (24) and (25) with regard to epistemic-type modals.

2.3.2. Some Interactions of Root-Type Modals and Negation

Let us turn next to consider the second asymmetry in (2)

with respect to root-type modals, which is revealed when we compare (2) with (1); namely, an asymmetry between root-type and epistemic-type modals that interact with either internal or external negation. Under our analysis, examples (2a, b) are assigned the following structures, prior to the application of LF Operator Movement:

(28) a. $[_{CP}\ [_{C'}\ [_{IP}$ Mary-wa gakkoo-o yasum-a
-top school-acc be absent
$[_{INFL}$ *na-i* *hazu-da*]]]]
Neg[2] should
'(lit.) Mary should not be absent from school'
(I expect that Mary will not be absent from school)

b. $[_{CP}\ [_{C'}\ [_{IP}$ Mary-wa gakkoo-o yasum-u
$[_{INFL}$ *hazu-ga* *na-i*]]]]
should Neg[1]
'(lit.) Mary shouldn't be absent from school'
(It is improbable that Mary will be absent from school)

We are assuming as before that modals and Neg are allowed to appear in COMP by Operator Movement at LF only if they are interpreted as clausal operators (cf. Condition (17)). Since root-type modals like *hazu-da* in (28a, b) behave as nonclausal operators, as characterized above, especially in contrast to epistemic-type modals, it follows that they can never undergo such movement to COMP, thereby remaining in their original place (i.e., in INFL) even at LF. Moreover, since *na-i* 'Neg[2]' in (28a) and *na-i* 'Neg[1]' in (28b) qualify as

internal (i.e., nonclausal) negation and external (i.e., clausal) negation operators, respectively, it follows that the former, but not the latter, is prevented from appearing in COMP at LF. Thus, after the application of LF Operator Movement, examples (28a, b) are analyzed as (29a, b), respectively:

(29) a. $[_{CP}\ [_{IP}$ Mary-wa gakkoo-o yasum-a $[_{INFL}$ *na-i hazu-da*]] $[_{COMP}\ \phi]]$

b. $[_{CP}\ [_{IP}$ Mary-wa gakkoo-o yasum-u $[_{INFL}$ *hazu-ga* $t_i]]$ $[_{COMP}$ *na-*$i_i]]$

Under the present analysis, neither of the structures in (29) constitutes apparent violation of Binding Principle (A). In (29a), needless to say, no variable-binding (by an A′-operator in COMP) is involved in itself (cf. Licensing Principle (18b)), which in turn implies that this structure is not subject to the Binding Theory at LF, resulting in no violation of Principle (A). In (29b), as sketched above, the variable, t_i, in INFL is c-commanded and A′-bound by the operator, *na-*i_i, in COMP, thus satisfying Binding Principle (A) and yielding the well-formed operator-variable structure at LF. Hence, this analysis permits us to predict the grammatical difference between (1) (=(23)) and (2) (=(29)) as well as the grammaticality of (29a, b) in a unified way.

Similarly, the next set of examples in (30) and (31) will examine the interactions of other root-type modals with either internal or external negation, providing further support for our analysis:

(30) Yahari, Donna-koto-ga atte-mo, oya-ni
after all what-thing-nom happen-ever parents-dat
uso-o tuk-u no-wa yoku
lie-acc tell NOM-top good
a. *na-i wake-da* (logical necessity)
Neg[2] ought to
'(lit.) After all, whatever may happen, it ought not to be a good thing to tell your parents a lie'
b. *na-i koto-da* (strong obligation)
Neg[2] be requested
'(lit.) After all, whatever may happen, it is requested not to be a good thing to tell your parents a lie'
c. *na-i mono-da* (weak obligation)
Neg[2] be expected
'(lit.) After all, whatever may happen, it is expected not to be a good thing to tell your parents a lie'

(31) Yahari, Donna-koto-ga atte-mo, oya-ni
after all what-thing-nom happen-ever parents-dat
uso-o tuk-u no-wa yoi
lie-acc tell NOM-top good
a. *wake-ga* (*wake-de-wa*) *na-i*
ought to Neg[1]
'(lit.) After all, whatever may happen, it oughtn't to be a good thing to tell your parents a lie'
b. *koto-de-*(*wa*) *na-i*
be requested Neg[1]

'(lit.) After all, whatever may happen, it is not requested to be a good thing to tell your parents a lie'

c. *mono-de-(wa) na-i*
be expected Neg[1]
'(lit.) After all, whatever may happen, it is not expected to be a good thing to tell your parents a lie'

It is crucially assumed here that none of the root-type modals in both (30) and (31), such as *wake-da* 'ought to', *koto-da* 'be requested', and *mono-da* 'be expected', can undergo LF Operator Movement (to COMP), and neither can *na-i* 'Neg[2]' (=internal negation) in (30), since they are all interpreted as nonclausal operators. Note that *na-i* 'Neg[1]' (= external negation) in (31), which behaves just as clausal operators, is permitted to appear in COMP at LF. Thus, if we apply to (30a, b, c) and (31a, b, c) LF Operator Movement along this line, we will thereby derive the relevant LF structures (32a, b, c) and (33a, b, c), respectively:

(32) Yahari, Donna-koto-ga atte-mo, $[_{CP}$ $[_{IP}$ oya-ni uso-o tuk-u no-wa yoku
a. $[_{INFL}$ *na-i wake-da*]] $[_{COMP}$ ϕ]]
b. $[_{INFL}$ *na-i koto-da*]] $[_{COMP}$ ϕ]]
c. $[_{INFL}$ *na-i mono-da*]] $[_{COMP}$ ϕ]]

(33) Yahari, Donna-koto-ga atte-mo, $[_{CP}$ $[_{IP}$ oya-ni uso-o tuk-u no-wa yoi
a. $[_{INFL}$ *wake-ga* t_i]] $[_{COMP}$ *na-*i_i]]

b. $[_{\text{INFL}}$ *koto-de(-wa)* $t_i]]$ $[_{\text{COMP}}$ *na-*$i_i]]$
c. $[_{\text{INFL}}$ *mono-de(-wa)* $t_i]]$ $[_{\text{COMP}}$ *na-*$i_i]]$

As suggested above, each of these structures in (32) and (33) is correctly ruled grammatical by the Binding Theory at LF, namely Binding Principle (A), exactly as in the case of (29a) and (29b), respectively.

Therefore, it is now found that the observed asymmetry between root-type modals, as in (1), and epistemic-type modals, as in (2), with respect to either internal or external negation would follow as a natural consequence of the requirement that the LF Binding Theory adopted here must license the appearance of only clausal operators in COMP at LF.

3. CONCLUSION AND FURTHER RESEARCH

This article has attempted to demonstrate that the observed asymmetries between root-type and epistemic-type modals with respect to negation can be ascribed to the Binding Theory at LF, in collaboration with the crucial assumption that both epistemic-type modals and Neg^1, being interpreted as clausal operators, do involve obligatory LF Operator Movement to COMP, while both root-type modals and Neg^2, as nonclausal operators, disallow such movement to COMP. In so doing, we have tried to achieve the semantic and syntactic characterization of Japanese modals, pointing out that epistemic-type modals are unique in having clausal scope that root-type modals lack. Then, it has been shown

that the standard (traditionally held) analyses are conceptually inadequate in that they suffer a number of serious problems, as noted earlier.

Before closing this article, we would like to suggest that this conclusion will have further empirical consequences of an interesting sort. That is, this mode of explanation, I believe, is capable of providing a principled account for a wide range of other related examples, including some multiple occurrences of modals, some interactions of modals and *wh*-phrases, and many others in Japanese.

NOTES

*I am grateful to Norio Suzuki for helpful and stimulating discussion. It goes without saying that all possible errors and shortcomings are inalienably mine.

1. For a semantically motivated account of the phenomena involving modals and negation in Japanese, see Teramura (1979), in which no syntactic explanation is provided for them in a unified way.

2. It is worth observing here that the (2a, b) pair, as it is claimed (cf. McGloin 1972: 57), are not perfectly synonymous. More concretely, (2a) means that the speaker knew that Mary had not been absent, had been wondering why, and had just learned why; everything had now become clear. In (2b), however, there is no reason to suppose that Mary will be absent from school, judging from what we know about her, but it remains to be seen. In the course of discussion, it will be shown that our analysis can provide a reasonable account for the difference in meaning between (2a) and (2b).

3. It is well known that there are two types of *sooda*, which should be clearly distinguished in our system: one type *sooda* is characterized by hearsay (i.e., *sooda*[1]), and the other type *sooda* by conjecture (i.e., *soo-da*[2]). Consider the following, which is due to Kageyama (1976: 71):

(i) a. Inu-ga kukkii-o *taber-u* *sooda*[1]
dog-nom cookies-acc eats I hear
'It is said that dogs eat cookies'

b. Inu-ga kukkii-o *tabe* *soo-da*[2]
to eat appear
'Dogs appear to eat cookies'

We can see from the fact that *sooda*[1] 'I hear' in (ia) takes a finite verb, but *soo-da*[2] 'appear' in (ib) takes an infinitive that the former is entirely like pure modals (i.e., belongs to epistemic-type modals), but the latter is more like main verbs (i.e., belongs to root-type modals). Furthermore, the root vs. epistemic distinction is evidenced by the fact that *sooda*[2] is allowed to be negated, but *soo-da*[1] is not.

4. Morphologically, epistemic-type modals are characterized as pure (i.e., finite) modals, while root-type modals as nonabstract (or abstract) nominalizers, such as *hazu* (in *hazu-da*) and *wake* (in *wake-da*), followed by auxiliary verbs of modality, such as *da* (cf. Makino 1968).

5. Following Zubizarreta (1982), we assume that root-type modals are treated essentially as supplementing the semantic content of main verbs (i.e., as modifiers).

6. In this regard, Zubizarreta (1982) claims that epistemic modals are distinguished from root modals with respect to θ-role assignment: the former have neither main nor adjunct θ-roles to assign, while the latter have no main θ-roles, but adjunct θ-roles to assign, both of which are exempt from the θ-criterion:

(i) *The θ-Criterion* (Chomsky 1981: 36)
Each argument bears one and only one θ-role, and each θ-role is assigned to one and only one argument.

Unlike root and epistemic modals, needless to say, main verbs, as main θ-role assigners, are subject to the θ-criterion (i). (See Roberts 1985 for relevant discussion on this matter.) Thus, this argument is compatible with our analysis, since we assume that root-type modals are in some degree intermediate between epistemic-type modals and main verbs.

7. With respect the nature of INFL, we follow Koopman (1984) in assuming that V-movement in Japanese moves a main verb into

INFL if INFL does not contain an auxiliary (i.e., a modal).

8. Note that we are assuming that since Japanese involves no *wh*-movement (i.e., Operator Movement) at S-structure (cf. Huang 1982), there is no obvious difference between the D- and S-structures (prior to the application of LF Movement) in their relevant respects.

9. We assume that Japanese is a configurational (as well as head-final) language having a VP node (see Kuroda 1983, Hoji 1985, Saito 1985, Whitman 1987, etc.).

10. Put another way, it is not until clausal operators appear in COMP at LF that the entire clause IP can fall under their scope.

11. For detailed arguments for LF Movement to COMP, see Lasnik and Saito (1984).

12. One might be tempted to argue that the specifier position of CP can be a potential landing site for Operator Movement at LF. However, we can exclude this possibility by invoking the Minimality Condition, as in Chomsky (1987):

(i) $[\alpha, \gamma]$ is a barrier for β iff α improperly includes $\gamma=\gamma^{max}$ and $\delta=\delta^{\circ}$, and β is included in γ and the complement of δ.

According to (i), we have a (minimal) barrier [C′, IP] (or C′) between *daroo*$_i$ and its trace in (13b), which blocks antecedent government: hence, such movement to the specifier position of CP is not allowed.

13. We may derive the ungrammatical status of (23b) from the following general rule of COMP Indexing, as suggested by Aoun (1985):

(i) COMP Indexing (Aoun 1985: 47)
$[_{COMP}\ \overline{\overline{X}}_i \ldots] \rightarrow [_{COMP_i}\ \overline{\overline{X}}_i \ldots]$
iff COMP dominates only i-indexed elements.

Nevertheless, our analysis, which crucially involves the first branch-

ing definition of c-command (cf. section 2.1), is highly preferable over Aoun's, in that it can provide a principled correlation between the following two observations: (i) every operator is allowed to appear in COMP at LF only if it takes scope over the clause (cf. section 2.1); (ii) COMP contains one and only one operator at LF (cf. section 2.3).

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